Small Business Innovation Research/Small Business Tech Transfer

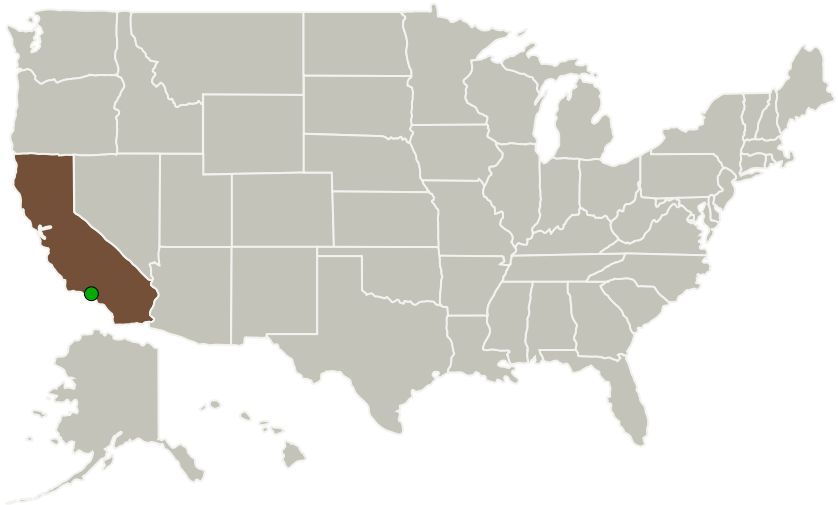
MEMS-Based Sensor for Monitoring Cabin Air Quality on the ISS, Phase I

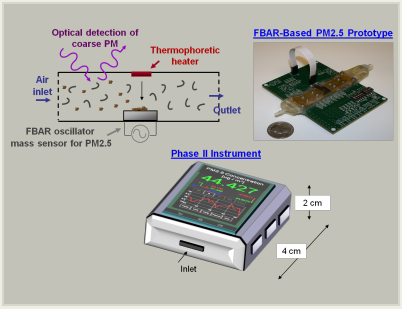
Completed Technology Project (2016 - 2016)

Project Introduction

In this Phase I project Aerodyne Microsystems Inc. (AMI) will investigate the feasibility of a miniaturized, low power, and inexpensive sensor to provide real-time measurements of particulate matter (PM). The MEMS-based instrument would be suitable for monitoring indoor aerosols in spacecraft cabins such as the ISS and would offer significant improvements over legacy solutions including reduced form factor and lower power consumption. The system utilizes a hybrid detection technique to monitor aerosol sizes from 50 um to 10 nm. For PM smaller than 2.5 um, the systems employs the thermophoretic deposition of particulates from a sample stream onto a thin-film bulk acoustic wave resonator (FBAR), and determines the mass deposited by measuring the frequency shift of an electronic oscillator. PM larger than 2.5 um (including lint and fibers) is optically measured with a novel detector configuration. The proposed technique is suitable for both spherical and non-spherical aerosols. The Phase I project will design, prototype and test key modules of the instrument, simulate and analytically model device behavior, develop interface and control electronics, and develop novel techniques for aerosol sampling and handling. AMI's proposed monitor is portable, offers an intuitive user interface, requires minimal maintenance, and can maintain calibration for extended periods of time. The platform requires no volatile working fluid, operates in low gravity, and offers the ability to log data for longer-term indoor air quality surveys.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Aerodyne Microsystems, Inc.	Lead Organization	Industry	Santa Clara, California
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Transitions

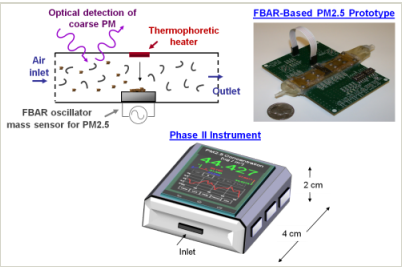
June 2016: Project Start

December 2016: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139881)*

Images



Briefing Chart Image
MEMS-Based Sensor for Monitoring Cabin Air Quality on the ISS, Phase I
(https://techport.nasa.gov/image/135839)

Final Summary Chart Image
MEMS-Based Sensor for Monitoring Cabin Air Quality on the ISS, Phase I Project Image
(https://techport.nasa.gov/image/127064)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Aerodyne Microsystems, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

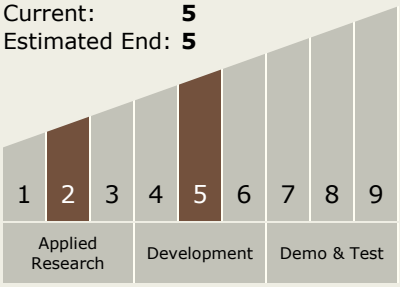
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
David Woolsey

Technology Maturity (TRL)

Start: **2**
Current: **5**
Estimated End: **5**



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Completed Technology Project (2016 - 2016)

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.4 Environmental Monitoring, Safety, and Emergency Response
    - TX06.4.1 Sensors: Air, Water, Microbial, and Acoustic

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System